

This Page Is Inserted by IFW Operations
and is not a part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

**As rescanning documents *will not* correct images,
please do not report the images to the
Problem Image Mailbox.**

WHAT IS CLAIMED IS:

1. A suture anchor having:
a first conical surface;
a base closing off the open end of said conical surface;
a central axis; and
an anchor bore across said conical surface.
2. The suture anchor of claim 1 wherein said base is substantially planar and oblique to said central axis.
3. The suture anchor of claim 2 wherein said anchor bore is parallel to the plane of said base.
4. The suture anchor of claim 1 further comprising a cylindrical surface extending between said open end of said first conical surface and said base.
5. The suture anchor of claim 1 wherein said base comprises a second conical surface inverted with respect to said first conical surface.
6. The suture anchor of claim 1 further including an accessory bore across said conical surface and substantially perpendicular to said anchor bore.
7. The suture anchor of claim 1 wherein said suture anchor is formed from a bioabsorbable material.

8. The suture anchor of claim 1 wherein said suture anchor is formed from a radiolucent material.

9. The suture anchor of claim 1 wherein said suture anchor is formed from bone.

10. The suture anchor of claim 9 wherein said suture anchor is formed from human bone.

11. The suture anchor of claim 1 wherein said suture anchor is formed from a material selected from the group consisting of polyethylene, polymethylmethacrylate, polysulfone, polylactic acid, polydioxanone, polyglycolic acid, hydroxyapatite, tricalcium phosphate, alumina and zirconia.

12. The suture anchor of claim 1 wherein said suture anchor is formed from polysulfone.

13. The suture anchor of claim 1 further including radiused areas joining said conical surface to said base.

14. A suture anchor for inserting into live human bone to secure a suture to said live human bone, said suture anchor consisting of human bone.

15. The suture anchor of claim 14, wherein said human bone is human cortical bone.

16. An insertion tool for inserting a suture anchor through a substantially cylindrical hole in a live human bone and causing said suture anchor to be anchored in said live human bone, said suture anchor

being substantially rigid and having a bore through which an end of said insertion tool is positioned, said suture anchor being shaped and said bore being oriented such that when said insertion tool is positioned in said bore and maintained parallel to said hole during insertion of said suture anchor said suture anchor must be reoriented in order to fit into said hole, said insertion tool comprising:

an elongated main body having a first end and a second end; and

an insertion end coupled to said first end of said main body for inserting into said bore of said suture anchor, said insertion end having properties wherein;

said insertion end has an initial configuration before insertion of said suture anchor through said hole;

said suture anchor causes said insertion end to bend from said initial configuration so that said suture anchor can fit through said hole while said main body of said insertion tool travels parallel to said hole; and

said insertion end substantially returns to said initial configuration when said suture anchor is positioned in cancellous bone tissue, thereby reorienting said suture anchor to be firmly anchored in said live human bone.

17. The insertion tool of claim 16 further including means for limiting the movement of said insertion end into said bore.

18. The insertion tool of claim 17 wherein said means for limiting movement comprises a thickened area between said main body and said insertion end.

19. The insertion tool of claim 17 wherein said insertion end is tapered from said main body, and said main body has a diameter wider than said bore.

20. The insertion tool of claim 16 wherein said insertion end is formed of a material having superelastic properties.

21. A system for anchoring a suture to live human bone through a substantially cylindrical bone hole having a longitudinal axis, said system comprising:

an insertion tool having a flexible insertion end having properties for returning said insertion end to an initial configuration; and

a substantially rigid suture anchor having a bore through which said insertion end of said insertion tool is positioned;

wherein said suture anchor is shaped and said bore is oriented such that said insertion end of said insertion tool bends away from its initial configuration during insertion of said suture anchor through cortical bone tissue and returns to its initial configuration when said suture anchor is positioned within cancellous bone tissue.

22. The system of claim 21 wherein said suture anchor has a conical surface, a base closing off said open end of said conical surface, and a central axis.

23. The system of claim 22 wherein:
the angle of said base with respect to said central axis of said suture anchor is oblique; and

said conical surface is a circular conical surface.

24. The system of claim 23 wherein:

 said bore is parallel to said base;
 said suture anchor has a leading edge along said base at which the angle between said base and said conical surface is most acute;

 said suture anchor has a trailing edge along said base at which the angle between said base and said conical surface is greatest;

 said insertion end of said insertion tool enters said bore adjacent said trailing edge; and

 said suture anchor is sufficiently long to force said insertion end of said insertion tool to bend from its initial configuration when said insertion tool enters said bone hole parallel to said longitudinal axis of said bone hole and with said base of said suture anchor parallel to said longitudinal axis of said bone hole.

25. The system of claim 22 wherein the apex of said conical surface of said suture anchor is truncated.

26. The system of claim 21 wherein said insertion tool further includes means for limiting the movement of said insertion end into said bore.

27. A method of anchoring a suture to live human bone through a substantially cylindrical bone hole having a longitudinal axis, said method comprising the steps of:

 selecting an insertion tool comprising a main body and a flexible insertion end having elastic

properties for returning said insertion end to an initial configuration;

selecting a substantially rigid suture anchor having a central axis and a bore at an angle to said central axis;

securing a suture to said suture anchor; positioning said insertion end of said insertion tool through said bore;

advancing said insertion tool towards said bone hole with said main body parallel to said longitudinal axis and said insertion end in its initial configuration, wherein said suture anchor, as oriented on said insertion end, is too large to fit through said bone hole;

advancing said insertion tool and said suture anchor into said bone hole, causing said suture anchor to reorient by bending said insertion end of said insertion tool; and

advancing said insertion tool into said bone hole until said insertion end having elastic properties is able to return to its initial configuration, thereby reorienting said suture anchor to its orientation prior to insertion into said bone hole.

28. The method of claim 27 wherein said step of securing said suture to said suture anchor further includes the step of inserting said suture through said bore in which said insertion end is inserted.

29. The method of claim 27 wherein said suture anchor further comprises an accessory bore, and said step of securing said suture to said suture anchor further comprising the steps of inserting said suture through said accessory bore.

30. The method of claim 27 further including the step of pulling said suture away from said bone hole after said suture anchor has been reoriented inside said bone-hole, to thereby further secure said suture anchor in said bone hole.

31. The method according to claim 27 wherein said suture anchor is the suture anchor of any one of claims 1-13.

32. A method of forming a suture anchor for inserting into live human bone to secure an end of a suture to said live human bone, said method comprising the steps of:

cutting a bone to form an elongated shape having a longitudinal axis;

drilling a bore in said bone at a first angle to said longitudinal axis.

33. The method of claim 32 wherein said step of cutting a bone comprises cutting a human cortical bone.

34. The method of claim 32 wherein said elongated shape has a substantially planar first end which first enters said hole in said live human bone during insertion of said suture anchor and a second end which last enters said hole in said live human bone during insertion of said suture anchor, said method further comprising the step of shaping said bone such that the plane of said first end is at a second angle to said longitudinal axis.

35. The method of claim 34 wherein the measurement of said first angle is substantially equal to the measurement of said second angle.

36. The method of claim 32 wherein said shaping step includes the step of shaping said bone to form a substantially conical solid having a conical surface, a base opposite the apex of said conical surface, and a central axis.

37. The method of claim 36 wherein:
said central axis is said longitudinal axis;

 said drilling step includes drilling said bore oblique to said central axis; and

 said method further comprises the step of cutting said base substantially parallel to said bore.